2. **MSc-Biosciences**: Test consists of 85 multiple choice items with following break up:

Subject	Number of Questions
Physics	08
Chemistry	08
Mathematics	08
Biosciences	61

Level of all subjects: BSc-Biosciences Curriculum, Jamia Millia Islamia. http://jmi.nic.in

3. **MSc-Biochemistry:** Test consists of 85 multiple choice items with following break up:

Subject	Number of Questions
Chemistry (Physical & Organic)	34
Biosciences (Cell Biology, Genetics & Biochemistry)	51

Level of all subjects: BSc-Biosciences Curriculum Jamia Millia Islamia. http://jmi.nic.in

Syllabus for M.Sc. Biosciences, and MSc Biochemistry Entrance Tests

Animal Diversity – I (BSB)

Unit I: Introduction to Invertebrate

General Principles of Taxonomy and Animal classification. Salient feature, and classification upto order in nonchordates.

Unit II: Phylum-Protozoa Porifera and Coelentrata

General characters of Protozoa: Type study of *Paramecium caudatum*. Protozoa and Human diseases. Origin of Metazoa, metamerism and symmetry. Type study of *Sycon,* with reference to reproduction and development. Polymorphism, Corals and Coral reef.

Unit III: Phylum-Platyhelminthes and Nematohelmithes, Annelida

General characters Study of *Taenia*, Parasitic adaptations. Type study of *Ascaris lumbriocodies*. Types and significance of Coelom, Study of Nephridial system in annelids.

Unit IV: Phylum Arthropoda

General characters: Metamorphosis in insects. Economic importance of insects. Lac culture, Sericulture, Apiculture and Prawn culture, Social insects and their life cycle. Type Study of Palaemon.

Unit V: Phylum Mollusca, Echinodermata and Minor Phyla

General characters: Type Study of *Pila globosa.* Torsion and detorsion in gastropods General Characteristics, Life history and development of asterias (star fish). General introduction of minor phyla and its example.

Recommended Books

1-   Ganguli, B.B., Sinha, A.K. and Adhikari, S., 2001, Biology of Animals, (Vol. I and III), New Central Book Agency, Calcutta.

2-   Kotpal, R.L., 1990, Modern Text Book of Zoology, Invertebrates, 8th Edition, Rastogi Publication, Meerut.

3-   Jordan, E.L., P.S. Varma, 2001, Invertebrate Zoology, S. Chand & Co., New Delhi.

Plant Diversity – I (BSB)

Unit I: Cyanobacteria

General features, Taxonomic position, Distribution, Cell structure, Heterocyst, Water bloom, Reproduction and economic importance with special reference to *Nostoc.*

Unit II: Algae

General features, Classification, Distribution, Range of thallus organization, Reproduction, Economic importance with special reference to *Chlamydomonas, Volvox, Oedogonium, Chara, Ectocarpus, Vaucheria* and *Polysiphonia.*

Unit III: Fungi
General features, Classification, Range of thallus organization, Reproduction, Parasexual cycle and economic importance with special reference to slime molds, *Albugo, Phytophthora, Penicillium, Agaricus, Puccinia* and *Alternaria.*

Unit IV: Lichens

General features, Classification, Distribution, Thallus structure, Ecological significance and economic importance.

Unit V: Bryophytes

General features, Classification, Distribution, Thallus organization, Reproduction, Economic importance with special reference to *Riccia, Marchantia, Anthoceros* and *Funaria.*

Unit VI: Pteridophytes

General features, Classification, Structure, Reproduction, Alternation of Generation, Stelar evolution, Heterospory and seed habit. Type study: *Psilotum, Lycopodium, Selaginella, Equisetum* and *Pteridium.*

Recommended Books

1- Alexopoulus, C.J., Mims, C.W. and Blackwell, M., 1996, Introductory Mycology, John Wley and Sons, Inc.

2- Kumar, H.D., 1988, Introductory Phycology, Affiliated East-West press Ltd., New Delhi.

3- Parihar, N.S., 1991, Bryophyta, Central Book Depot, Allahabad.

4- Parihar, N.S., 1996, Biology & Morphology of Pteriodophytes, Central Book Depot, Allahabad.

5- Stewart, W.N. and Rathwell, G.W., 1993, Paleobotany and the Evolution of Plants, Cambridge University Press.

6- Vashishta, P.C., 1991, Pteridophyta (Vascular Cryptogam), S. Chand & Co. Ltd. Delhi.

7- Pandey, Mishra & Trivedi, 2001, A Text Book of Botany, Vol. I & II, Publishing House, New Delhi.

Cell Biology (BSB)

Unit I

Cell as a basic unit of living system. Biochemical composition of cell : protein, lipid, carbohydrate, nucleic acid. The cell theory. Ultrastrcuture of cell.

Membrane composition, Early studies on Plasma Membrane. The lipid bilayer/membrane. A summary of membrane functions – simple diffusion, Facilitated transports. Active transport, Endocytosis, Pinocytosis, Phagocytosis, Exocytosis.

Unit II

Structure and Function of the Endoplasmic reticulum, Golgi complex, Lysosome, Ribosome, Mitochondria and Chloroplast. Brief introduction to photosynthetic process. Evolution of mitochondria and chloroplast.

Unit III

Structure and Function of Nucleus, Nuclear envelope, Structure of Chromatin, Nucleosome and chromosome, Cell cycle, Mitosis & Meiosis.

Unit IV

Cell-cell interaction, Cell locomotion (amoeboid, flagellar and ciliar). Muscle and Nerve cell, Cell senescence and death, Cell differentiation.

Unit V

Nucleic acids, Structure of DNA, DNA as genetic material: discovery of transformation & experiment of Hershey & Chase, DNA replication, Structure and types of RNA, transcription, Post transcriptional modifications, Methylation, Capping & splicing, Polyadenylation.

Unit VI

Genetic Code: Evidence & Essentiality of Codon, Triplet code, start and stop condons. Overlapping genes and reading frames, universality of genetic code, Protein synthesis, mechanism in prokaryotes and eukaryotes, Post translational modification and cell secretion.

Recommended Books

1- Robertis De, E.D.P. & E.M.F.De Robertis, 1987, Cell and Molecular Biology, Lea & Febiger.

2- Bruce Albert, Dannis Bray, Julian Lewis, Martin Raff. Keith Roberts, James D. Watson, 2000, Molecular Biology of Cell, 4th Edition, Garland Publishing Inc., New York, USA.

3- Harvey Lodish, 1999, Molecular Cell Biology, W.H. Freeman & Co. 4th Ed.

4- Darnell, J.E., 2000, Molecular Cell Biology, W.H. Freeman & Co.

Organic Chemistry-I (BSB)

Unit I : Structure and Properties

Electronic configuration, Atomic and Molecular orbitals, Convalent bond, Hybrid orbitals: sp, sp2 & sp3, Bond length, Bond angle and Bond dissociation energy, Polarity

of bonds and molecules, Intermolecular forces, Melting point, Boiling point, Solubility, Acid & Base in organic chemistry.

Unit II : Alkanes and Radical reactions

Structure of methane, ethane, propane & butane, Nomenclature, Physical propeties, Reactions of alkanes: combustion, pyrolysis and halogenation. Radical reactions: production and reaction of radicals, homolytic bond dissociation energies, relative stabilities of raidcals, halogenation of methane, halogenation of higher alkanes, selectivity of bromine, other important radical chain reactions.

Unit III : Alkyl halides and Ionic reactions

Structure, classification, nomenclature and physical properties, Reactions, of Alkyl halides: Nuleophilic substitution reactions (Nucleophiles & leaving groups, Thermodynamics & kinetics, SNI & SN2 reactions: mechanism, kinetics, stereochemistry and reactivity, Carbocations: structures, relative stabilities & rearrangement, Factors affecting rates of SNI & SN2 reactions), Eliminaiton reactions of Alkyl halides: Dehydrohalogenation, E1 & E2 reactions and cleavage of Alkenes: Halogenation and ozonolysis.

Unit IV : Alkenes

Carbon-Carbon double bond, structure of ethylene, propylene & butylene, Geometric isometric isomerism, Nomenclature & Physical Properties, Reactions of Alkenes: Addition reactions (addition of hydrogen, hydrogen halides, sulphuric acid, water, alkenes, alkanes & radicals), preparation of alcohols, oxymercuration-demercuration and hydroboration oxidation processes, substitution reactions and cleavage of Alkene: Halogenation and ozonolysis.

Unit V : Alcohols

Structure & Nomenclature, Physical properties, Chemistry of OH group, Alcohols as acids & bases, Reactions of Alcohols: Reactions with hydrogen halide, phosphorous trihalide and thionyle chloride, Conversions of alcohols into mesylates, tosylates, alkyl halide & alkyl phosphates, Dehydration of alcohols (mechanism, carbocation stability & molcecular rearrangement), synthesis of ethers from alcohols, Intermolecular dehydration, Williamson synthesis, Oxidation of alcohols, Methods of protecting –OH group.

Unit VI : Aldyehydes and Ketones

Structure, Nomenclature and Physical properties, Nucleophilic addition to carbon-oxygen double bond, Reaction of Aldehydes and Ketones: Oxidation, Baeyer Villager oxidation, Reduction to alcohols & hydrocarbons: Clemmensen & Wolff Kishner reduction, Reductive amination, Addition of water & alcohols (hydrates, hemiacetal, hemiketal, acetal, ketal, cyclic ketals, thioacetals & tioketals), Additions of derivatives of ammonia (reactions with hydroxylamine, hydrazine, phenylhydrazine & semincarbazide), Addition of hydrogen cyanide & sodium bisulphite, Addition of Halides : Wittig reaction, Aldol reactions: enolate ions, keto-enol tautomerism, reactions via enol and enolate ions

(recemization, halogenation of ketones, haloform reaction, aldol condensation & related reactions).

Unit VII : Carboxylic acids and their Derivatives

Structure, Nomenclature, Physical properties and Acidity of carboxylic acids, Reactions of carboxylic acids: Nucleophilic substitutions at acyl carbon, Conversion into acyl chloride, anhydrides, lactones, nitriles esters, amides and lactams, Reduction of carboxylic acids, substitution in alkyl or aryl group, Decarboxylation of carboxylic acids, Reactions of acyl chloride and acid anhydrides, Reaction of Esters: Conversion into acids and acids and acid derivatives (Hydrolysis, ammonolysis & alocholysis), Reduction to alcohols, Reactions with carbanion (claisen condensation).

Unit VIII : Amines and Amides

Structure, Nomenclature, Physical properties and Basicity of Amines, Reactions of Amines: Oxidation, Reactions of Amines with nitrous acid, Replacement and coupling reactions of Arenediazonium salts, Conversion to amides and sulfonamides, Hofmann and Cope eliminations. Reactions of Amides: hydrolysis, conversion to imides, Hofmann degradation.

Recommended Book

1-   Morrison & Boyd, 1992, Organic Chemistry, Addiso-Wesley Pub. Co. 6th Edition.

2-   Finar, I.L., 1988, Organic Chemistry, vo. I & II, Wiley John & Sons.

3-   Soni, P.L., 2001, Organic Chemistry, S. Chand & Co., New Delhi.

Physics – I (BSB)

Unit I

Vector and scalar quantities. Addition, substraction, multiplication of vector quantities. Pratial derivatives and elementary ideas of gradient, divergence and curl.

Unit II

Description of motion in two and three dimensions. Newton's laws of motion. Invariance of Newton's laws in Galalian transformations. Pseudo forces. Limitations of Newtonian mechanics. Need for relativistic and quantum mechanics (only elementary idea). Conservation of momentum. Centre of mass. Funding center of mass for discrete and continuous distributions of mass.

Unit III

Work-Energy theorem. Work done by a variable force. Numerical method. Potential energy. Electrical potential energy in a capacitor and inductor. Conservative forces.

Scattering and collisions. Elastic and inelastic collisions. Reactions and decay processes. Rutherford's scattering.

Unit IV

Angular momentum. Torque. Moment of inertia. The cases of ring, disc axis and sphere. Parallel and perpendicular theorems. Rotational kinetic energy and conservation of angular momentum. Combination of angular and translational motion.

Unit V

Simple Harmonic motion. Damped and forced oscillations. Resonance. Waves in an elastic medium. Power and internsity of a wave. Wave particle duality. De Broglie waves. Group and phase velocity. Davisson and Germer experiment. Compton effects.

Unit VI

Fluid pressure and density. Pascal's and Archemede's laws. Bernoulli's equation. Surface tension and viscosity. Fluid dynamics. Capillary flow.

Unit VII

Temperature. Macro and microscopic definitions. Measurement of temperature. First law of thermodynamics. Reversible and irreversible processes. Second law of thermodynamics. Carnot's cycle. Absolute scale. Entropy. Statistical interpretation of entropy. Maxwellian distribution of molecular velocities.

Unit VIII

Towards quantum mechanics. Planck's law of radiation and qualitative idea of quanta of radiations. Uncertainty and complementarily. Wave packets in space and time. Schrodinger's wave equation. Wave function. Expectation value.

Recommended Books

1. Resnick, Rand Holliday, D., 2000, Physics Part I, Tata McGraw Hill.

2. Zeemansky, M.W., 1998, Thermodynamics, McGraw Hill.

3. Brijlal & Subramanyam, 1995, Heat & Thermodynamics, S.Chand & Co. Ltd., New Delhi.

4. Goldsdein, 1998, Classical Mechanics, Narosa Publications.

5. Mani, H.S. & Mehta, G.K., 2002, Modern Physics, East West Press Pvt. Ltd., Delhi.

Mathematics – I (BSB)

Unit I : Set Theory

Sets and their representations, finite and infinite sets, subsets, empty set, universal set, complement of a set, union and intersection of sets and their algebraic properties, difference of sets, Venn diagram, ordered pairs, cartesian product, application.

Unit II : Matrices and Determinants

Definition and examples of matrices, types of matrices, basic operations, equality of matrices, addition and scalar multiplication of matrices, properties of addition and scalar multiplication, transpose of a matrix, symmetric, skew-symmetric matrices and their properties, matrix multiplication in general and its properties. Definition of determinant, minors and cofactors of an element of a determinant, linear equations in matrix notation, Consistent and inconsistent systems of linear equations, Cramer's rule, singular and non-singular matrices, cofactor matrix, adjoint of a matrix, determinant of the adjoint of a matrix, the multiplicative inverse of a matrix and its properties, solution of simultaneous equations in three variables by matrix inverse methods.

Unit III : Permutation, Combination and Binomial Theorem

The factorial introduction. Fundamental principle of counting, Permutation as arrangement, practical problems on permutations, permutations under certain conditions. Combinations, practical problems on Combinations, Combinatorial identities. Binomial theorem for any positive integral exponent (without proof), general and middle terms, Binomial theorem for any index, some applications of Binomial theorem.

Unit IV : Probability

Random experiment and associated sample space, events definition of probability of an event, algebra of events, addition and multiplication theorems on probability (without proof). Conditional probability, independent events.

Unit V : Statistics

Methods of sampling, measures of central tendency (mean, median and mode), measures of variation (mean deviation and standard deviation). Correlation, Covariance, Karl Pearson's Coefficient of Correlation, degree of correlation. Regression, regression coefficient, method of least sqnares. Binomial, Poisson and Normal distributions.

Books Recommended

1-   Seymour Lipschutz, 1981, Set Theory, (Schaum's Outline Series) McGraw-Hill Book Co.

2-   Frank Ayres, J.R., 1974, Matrices, (Schaum's Outline Series) McGraw-Hill Inc.

3-   Murray R. Spiegel, 1980, Probability and Statistics, Schaum's Outline Series) McGraw-Hill Book Co.

4-   Arora, P.N. and P.K. Malhan, 2002, Biostatistics, Himalaya Publishing House.

Animal Diversity – II (BSB)

Unit I: Origin & General Characteristics of Chordates

Chordate Characters, origin and evolution of chordate groups, Scheme of Chordate classification.

Unit II: Primitive Chordates

General Characteristics, Structure and affinities of *Balanoglossus*, General Characteristics, structure, affinities of *Herdmania.*

Unit III: Cyclostomes and Pisces

The lamprey-habit and habitat, External features, Internal anatomy, Economic importance, General characteristics of Pisces, migration, Accessory respiratory organs in fishes, Pisciculture.

Unit IV: Amphibia

Origin, general characteristics & classification upto orders, Parental care, Type study : *Rana tigrina*

Unit V: Reptillia

General characteristics & classification upto order, Identification of snakes, Biting mechanism, Venom and antivenom, Extinct reptiles.

Unit VI: Aves and Mammals

General characteristics, Flight adaptation and migration in birds, Origin and evolution of bird, General characteristics of Prototheria, Metatheria & Eutheria, Evolution of horse and Man.

Unit VII: Histology

Tissue types and histology of liver, kidney, pancreas, stomach, intestine, thyroid gland, testes and ovary.

Recommended Books

1-   Green N.P.O. et al., 1995, Biological Scienes, Second Edition, Cambridge University Press.
2-   Kotpal R.L., 2001, Modern Text Book of Zoology, Vertabrates, Rastogi Publication, Meerut, India.

3-   Parker T.J. and Haswell W.A., 1990, A Text Book of Zoology, Vol. II Revised by A.J. Marshall. Low Priced Publication Delhi.

4-   Sinha, A.K., Adhikari, S., and Ganguli, B.B., 2001, Biology of Animals (Vol.-II & III), New Central Book Agency, Calcutta.

5-   Subramoniam, T., 2002, Developmental Biology, Narosa Publishing House Pvt. Ltd., New Delhi.

6-   Parker, T.J. and Haswell, 1995, A Text Book of Zoology (Vol. I & II), 7th Edition, Low Price Publication, Delhi.

7-   Leeson & Leeson, 1984, Histology, WB Saunders – Igaku Shoin Publication Philadelphia & Tokyo.

Plant Diversity – II (BSB)

Unit I: Gymnosperms

General features. Classification, evolution, distribution, external features, comparative anatomy, development, reproduction, affinities and economic importance with special reference to (a) *Cycas*, (b) *Pinus*, & (c) *Gnetum & Ephedra,* Evolutionary parallelism between Gymnosperms and Angiosperms.

Unit II: Angiosperms

General features, classification and evolution, History and principles of classification, Botanical nomenclature and units of classification, Outlines and relative study of the important systems of classification of Angionsperms viz. Bentham and Hooker's system, Engler and Prantel's system and Hutchinson's system.

Unit III

Life history of a typical Angiosperm. Systematic study, affinities, distinguishing characters of the following families of Angiosperms with special reference to Ranunculaceae, Cruciferae, Malvaceae, Leguminaceae, Umbellifecae, Compositae, Solanaceae, Labiatae, Liliaceae, Palmae, Graminae.

Unit IV

Androgenesis & gynogenesis, Pollination biology, Structural and functional aspects of pollen & pistil, Self and inter-specific incompatibility, Fertilization & control of fertilization, Embryo and seed development.

Unit V

Centres of origin and gene diversity in Botany, Utilization and improvement of plants of food, drug, fibre and industrial values.

Recommended Books

1-   Bhatnagar, S.P. and Moitra, A., 1996, Gymnosperms New Age International Pvt. Ltd., New Delhi.

2-   Davis, P.H. and Heywood, V.H., 1973, Principles of Angiosperms Taxonomy, Robert E. Krieger Pub. Co., New York.

3-   Grant V., 1971, Plant Speciation, Columbia Univ. Press, London.

4-   Harrison, H.J., 1971, New Concepts of Flowering Plant Toxonomy, Hieman Educational Books Ltd., London.

5-   Nordenstam, B., El Ghazaley, G. and Kassar, M., 2000, Plant Systematics for 21st Centry, Portland Press Ltd., London.

6-   Takhtajan, A.L.,1997, Diversity and Classification of Flowering Plants, Columbia Univ. Press, New York.

7-   Pandey, Mishra & Trivedi, 2001, A Text Book of Botany, Vol. II & III, Vikas Publishing House Pvt. Ltd., Delhi.

8-   Vashishta, 1976, Botany for Degree students (Algae, Fungi, Bryophta & Gymnosperms, S. Chand & Co. Ltd., Delhi.

9-   Biswas, C. and Johri, B.M., 1998, The Gymnosperms, Spinger Verlag.

Genetics (BSB)

Unit I: Mendelian Analysis, Chromosome Theory of Inheritance

Genotype and phenotype, Experiments of Mendel: Theories of blending & particulate inheritance, Monohybrid cross and law of segregation, Dihybrid cross and law of independent assortment, Trihybrid cross, Chromosome theory of inheritances: Sutton-Bovery theory, Sex determination in plants and animals, Sex linkage, Work of TH Morgan, Non-disjunction as proof of chromosome theory of inheritance: Work of Calvin Bridges, X-linked inheritance genetics and sexual cycle in haploids and alternating haploids diploids, Mendelian. Linkage; mapping genes; interference; coincidence in pro- and eukaryotes.

Unit II: Extension of Mendelian Analysis

Variation of dominance relations: Incomplete dominance, Overdominance and codominance, Multiple Alleles, Pleiotropism; lethal genes, balance lethal system, Penetrance and expressivity, Segregation distortion, Gene interaction; example of & type of interaction in modified dihybrid Mendelian ratios of 9:3:4, 9:7, 12:3:1, 15:1, 13:3, 9:6:1, 7:6:3, 6:3:3:4, and 7:4:3:2, epistasis, additivity, Interaction between more than two gene pairs, Modifiers Linkage and Recombination: discovery of linkage, linkage groups, complete and incomplete linkage, recombination, linkage symbolism & maps, four strand crossing over, detection of linkage, Double crossovers, Coincidence & interference.

Unit III: Chormosomes Structure and Mutations

Structural organisation of chromatin, eu- and heterochromatin; Structure of Chromosome; Special chromosome (e.g., polytene and lampbrush chromosomes); banding patterns in human Chromosomes. Structural and numerical aberrations involving chromosomes; evolution of wheat, cotton and rice; hereditary defects – Kleinefelter, Turner, Cri-du-chat and Down syndromes. Translocation, Abnormal euploidy: monoploids, triploids, polyploids, autotetraploids and allopolyploids. Mutations – spontaneous and induced; chemical and physical mutagens; induced mutations in plants, animals and microbes for economic benefit of man.

Unit IV: Extrachromosomal Inheritance

Mitochondrial and chloroplast genetic system, Cytoplasmic Inheritance. Male sterility, maternal effects, extra nuclear genome, variation in leaves of higher plants, shell coiling in snails, extra nuclear genes in Chlamydomonas.

Population genetics: Hardy-Weinberg equilibrium, gene and genotypic frequencies

Unit V: Microbial Genetics

Conjugation, Transduction, Transformation; Isolation of auxotrophs, Replica plating techniques, Analysis of mutations in biochemical pathways.

Unit IV: Nature of Gene and Basic Genetic Engineering

Nature of the Gene, one gene one enzyme hypothesis, gene-protein relation, Genetic fine structure, Colinearity of gene & protein, Inducible and constitutive operons, Manipulation of DNA: denaturation of DNA by heat, reassociation of complimentary strands, Engineering: restriction enzymes, formation of recombinant DNA, vectors, cloning strategies, detection of clone genes, applications of recombinant DNA technology, PCR technology.

Recommended Books

1-   Strickberger M.W., 2002, Genetics, Prentice Hall, India.

2-   Friefelder, D., 1993, Molecular Biology, Jones & Barltlett Publishers, Boston, London.

3-   Lewin, B., 2000, Genes VII, Oxford University Press.

4-   Friefelder, D., 1993, Molecular Biology, Jones and Bartlett Publishers, Bostan, London.

5-   Kornberg, A., 1991, DNA Replication, W.H. Freeman & Co.

6-   Brown, T.A., 1998, Genetics: a molecular approach, Chapman & Hall, London.

7-   Brown, T.A., 2001, Gene Cloning and DNA analysis, Blackwell Science.

Physical Chemistry (BSB)

Unit I: The Behaviour of Gases

Properties of Gases: The gas laws (kinetic theory of gases, the pressure and volume concept, absolute temperature scale; equation of state, the ideal and real gas laws; vapour pressure and vapour density (Dalton's law of partial pressure), diffusion of gases (Graham's law of diffusion and its application to biological problems).

Unit II: Some Properties of Aqueous Solutions of Nonvolatile and Volatile electrolytes

Definition and type of solution; expressing the concentration of solution; colligative properties (definition); Roults' law; activity and activity coefficient; Roults' law and molecular weight of the solute; elevation of boiling point; depression of freezing point, osmotic pressure; definition, laws of osmotic pressure, vant Hoff theory of dilution; determination of molecular weight, theoretical explanation of osmosis.Osmotic behaviour of living cells: tonicity, turgor pressure.

Unit III: Solution of Electolytes

Electrolytes (True and Potential), Ionization of electrolytes, Colligative properties of true electrolytes (The vant Hoff factor, the nonideality of solution, activity and activity coefficient, ionic strength of the solution and its effect on Debye-Huckel limiting law) Colligative properties of potential electrolytes; (Ionization and degree of ionization. Solubility of Salts: Thermodynamic and apparent solubility products, salt or electrolyte effect, the common in effect.

Unit IV: Acid, Bases and Buffers

Introduction (Biological relevance of pH); Concepts of acids and bases (the ionization of water; definition of pH, pH-scale, Arrhenius concept; strength of acids and bases). The exact treatment of the ionization of monoprotic acid in water; Relation between initial acid concentration, pKa and pH, Henderson-Hasselbalch equation, dependence of ionization on pH of solution, uses of the H-H equation, titration of strong and weak acids with strong base. Exact treatment of the ionization of diprotic acid. Exact treatment of Bronsted lowery type monobase. Salt hydrolysis. Buffer mixtures (buffering range, buffering capacity). pH indicators, Biological relevance of pH: buffering in living organism, effect of pH on protoplasmic components.

Unit V: Ist Law of Thermodynamics and Thermochemistry

First law of thermodynamics, energy changes in relation to changes in properties of the system, enthalpy of a system, heat capacity of a system, relation between Cp & Cv in gaseous system, Tehrmochemistry: Heats of reaction , chemical energy, change of internal energy and enthalpy in a chemical reaction, Kirchoff's law, Heat of formation, neutralisation, dilution and precipitations, Determination of heats of reactions: Bomb Calorimeter and Dewar vaccuum flask.

Unit VI: Laws of Thermodynamics

Need and statement of the 2nd law, concept of entropy, entropy change in reversible and irreversible processes, entropy as a functions of temperature and volume or pressure, entropy changes in ideal gas, standard entropies, Helmholtz & Gibbs free energy functions, variation of free energy with temperature and pressure. Maxwell's relationships, Gibbs Helmoholtz equation, chemical potential, Gibbs-Duhem equation, variation of chemical potential. General conditions for equilibrium & spontaneity, conditions for equilibrium & spontaniety under constraints, law of mass action, Van't Hoff-isotherm and law of chemical equilibrium, standard free energy and equilibrium constant of a reaction, relation between Kp and Kc, dependence of equilibrium constant, with temperature and pressure, Calapeyron-Clausius equation and its applications for liquid-vapour, solid-vapour & soli-liquid equilibria, concept of fugacity and activity, determination of fugacity, activity coefficient.

Third law of thermodynamics, variation of entropy with temperature, determination of absolute entropies of liquids & gases, Applications of the III law of thermodynamics.

Unit VII: Chemical Kinetics and Photochemistry

Definition of terms: reaction rate, order and molecularity. Rate measurements and rate laws, Factors influencing rates of reactions. Zero, I and II order reaction with examples. Mathematical treatments of rate constants of I and II order reactions. Calculation of activation energy, Collision and absolute theory of reaction rates.

Recommended Books

1.   Atkins, P.W. 2001, Physical Chemistry, W.H. Freeman & Co. 7th Edition.

2.   Clydel., R., Metz, 1988, Schaum's Series Outline of Physical Chemistry, McGrawHill.

3.   Puri & Sharma, 2002, Physical Chemistry, S. Chand & Sons Co.

4.   Bahl & Tuli, 2002, Essential of Physical Chemistry, S. Chand & Sons. Co.

5.   Gordon, G., Hammes, 2000, Thermodynamics and Kinetics for the Biological Sciences, John Wiley & Sons.

Physics – II (BSB)

Unit I

Coulomb's law, Electrostatics, Electric field for different cases of charge distributions. Electric potential. Field as potential gradient. Capacitance. Multipolar expansion of potential due to a given charge distribution, Guass's law and its applications. Dielectrics. Polarization Peizo, pyro and ferroelectricity.

Unit II

Electric current. Ohm's law, Kirchoffs laws and applications. Potentiometer. Wheatstone bridge. Heat generated in resistor. Thermoelectricity. Peltier and Thomson's effects. Conductivity in metals.

Unit III

Magnetism. Magnetic field around conductors during the passage of electric currents. Magnetic field of permanent magnets. Ferromagnetism. Earth's magnetic field. Faraday's laws. Electromagnetic induction. Lenz's rule, Lorentz force. Self and mutual induction. Transformers. Alternating current Dia and para magnetism.

Unit IV

Electromagnetic oscillations. Damped and undamped induced oscillations. Electromagnetic waves in conductors and in dielectrics. Electromagnetic waves spectrum, Technological applications.

Unit V

Semiconductors. Band theory of solids. Diodes and Zener diodes. Properties and applications. Transistors. PNP and NPN transistors. Characteristics of a transistors. Common base amplifier. Operational amplifier (Basics). Oscillator. Field effect transistor (FET) (basic idea only).

Unit VI

Electrode processes. Galvanic cells. Theory of electical double layers. Electrkinetic phenomena. Planck-Henderson. Nerstplanck equation. Diffusion potential. Donnan Potential. Brownian motion. Fick's I & II laws. Stock's law.

Unit VII

Fundamentals of atomic physics. Interpretation of atomic spectra. Hydrogen and hydrogen like atoms. Electronic, vibrational and rotational spectra.

Recommended Books

1. Resnick & Holliday, 2000, Physics Part II, Tata McGraw-Hill.
2. Griffith, D.J., 2000, Introduction to electronics, Prentice-Hall of India.
3. Tayal, D.C., 1999, Basic Electronics, Himalya Publishing House.
4. Mahajan, A.S. & Rangwala, A.A., 1998, Electricity and Magnetism, Tata McGraw-Hill.
5. Bieser A., 2002, Concept of Modern Physics, McGraw-Hill, International Edition.
6. Schaum's Outlook Series, 1993, Electromagnetic McGraw-Hill.

Mathematics - II (BSB)

Unit I : Functions

Concept of functions, its domain and range, graphs of some well-known functions, even and odd functions, periodic functions, polynomial functions, absolute value functions, greatest integer function, signum function, algebra of functions, composite functions. Inverse of a function, exponential, hyperbolic and logarithmic functions, trigonometric functions, inverse functions of trigonometric functions.

Unit II : Differential Calculus

Limits, left hand and right hand limits, algebra of limits, continuity of a function at a point, over an open/closed interval, sum product and quotient of continuous functions, continuity of mathematical functions. Derivative of a function, its geometrical and physical significance, relationship between continuity and differentiability. Derivative of sum, difference, product and quotient of functions. Derivative of trigonometric functions, inverse trigonometric functions, hyperbolic functions, inverse hyperbolic functions, logarithmic functions, exponential functions, implicit functions. Logarithmic differentiation, derivative of functions expressed in parametric form, derivatives of higher order (excluding nth order).

Unit III : Applications

Tangents and normals, maxima and minima, asymptotes, concavity and convexity, singular points, tracing of standard curves (cartesian form only).

Unit IV : Integral Calculus

Integration as the inverse process of differentiation, indefinite integral, anti-derivative or primitive function, standard formulae, the fundamental laws of integration, methods of integration : by substitution, by parts, by long division, by partial fractions, by successive reduction. Integrals of the type

$$\int \frac{dx}{ax^2+bx+c} \ , \quad \int \frac{(px+q)dx}{ax^2+bx+c} \ , \quad \int \frac{dx}{\sqrt{ax^2+bx+c}} \ , \quad \int \frac{(px+q)dx}{\sqrt{ax^2+bx+c}} \ , \quad \int \sqrt{ax^2+bx+c} \ dx$$

$$\int (px+q) \sqrt{ax^2+bx+c} \ dx \quad , \quad \int \frac{dx}{(x-k) \ \sqrt{ax^2+bx+c}} \quad , \quad \int \left(\frac{a \, Cosx+bSinx}{c \, Cosx + d \, Sinx} \right) dx \ ,$$

$$\int \left(\frac{a \, Cosx+bSinx+c}{d \, Cosx +e \ Sinx+f} \right) dx \ , \quad \int \frac{dx}{a+b \, Cosx} \ and \quad \int \frac{dx}{a+b \, sinx}$$

Unit V : Applications

Definition of definite integral as the limit of sum. The fundamental theorem of calculus (without proof), evaluation of definite integrals, transformation of definite integrals by substitution, evaluation of definite integrals by parts. Properties of definite integrals and

problems based on these properties. Area bounded by a curve, between two ordinates and X-axis, area between two curves. Lengths of plane curves.

Unit VI: Differential Equations

Differential equation, order and degree of a differential equation, solution of a (first order and first degree) differential equation by the method of variables seprable. Homogeneous equations and their solution, solution of the linear equation of first order of the type $dy/dx + P(x)y = Q(x)$.

Books Recommended

1- Shanti Narayan, 1999, Differential and Integral Calculus, S.Chand & Company Ltd.
2- Frank Ayres, Jr., 1992, Theory and Problems of Differential Equations, Schaum's Outline Senes, McGraw Hill Book Company.
3- Frank Ayres, Jr. and Elliott Mendelson, 1992, Differential and Integral Calculus Schasun's Outline series, McGraw Hill Book Company.
4- N. Piskunov, Differential and Integral Calculus, 1981, CBS Publishers & Distributors.
5- Frank Ayres, J.R., 1992, Theory and Problems of Differential Equations. Schaum's Outline Series, McGraw-Hill Book Co.

Ecology (BSB)

Unit I: General

Definition, history, subdivisions of ecology. Definition & components of environment. External and internal environment. Natural and man made environment. Population, community (type of communities), ecosystems (components of ecosystems, types of ecosystem), biosphere.

Unit II: Ecological Factors

1. Light- (Albedo, Sciophytes, Heliophytes, Compensation point), temperature altitutidinal and latitudinal variation, Temperature stress, Stenothermal, Eurythermal organisms, Permafrost, Homeotherms, Poikilotherms.

   Precipitation- Humidity, Monsoon, Gases –CO_2, O_2 cycles. Wind-Global air circulation, Inversion, Windbreak, Fire.

2. Topographic-Height direction of mountain and valley, steepness and exposure of slopes.

3. Edaphic- Soil formation (Weathering of rocks, Mineralisation and humification), Soil nutrient, Soil cation exchange capacity, nutrient availability, Soil moisture, Soil texture, Soil type, Soil aeration, Soil mixing.

4. Biotic- Positive and negative interactions.

Unit III: Ecosystem Study

Types of ecosystems (Aquatic & terresterial, natural and man made, Ocean, estuaries, lakes, rivers, grass lands, forest types, fish and fisheries of India with respect to the management of estuarine, coastal water system and man made ecosystem) Structure of ecosystem (Special diversity, Species structure, Trophic levels), Function of ecosystem (Energy flow, Material cycling – hyderological, gaseous and sedimentrary), Ecological pyramids, Primary and secondary productivity, Food chains (Grazing and detritus), Food web.

Unit IV : Ecological Adaptations

Morphological, Anatomical & Physiological adaptations of Hydrophytes, Mesophytes and Xerophytes.

Unit V: Ecological Succession

Community origin and development. Types of Succession – Pressere (primary), Subsere (Secondary), Allogenic and deflected Causes of Succession – Climatic, Topographic & Biotic, process and succession, Nudation Invasion, Migration, Ecessis, Aggregation, Competition, Reaction and Stabilization, Climax.

Unit VI: Community Structure, Ecotone, Edge Effect

Analytical Character, Qualitative (Floristic composition Stratification, Periodicity, Vitality, Life forms). Quantitative (Populaiton density, Cover Height, Weight). Synthetic –Presence & Constancy, Fidelity, Dominance, Pysiognomy & Pattern, Frequency, Importance value index, Species diversity, Biological Spectrum, Community study by Quadret and Transect methods.

Unit VII: Population Dynamics

Density, Mortality, Natality, Population dispersal, Age distribution, Population distribution, Population growth, Carrying capacity, Population regulation, Factors effecting biotic potential.

Unit VIII: Environmental Pollution

Air Pollution – CO_2, SO_2, NO_x, O_3, CFC, PAN, green house effect, O_3 hole, acid rain, Meterological factors.

Water Pollution –BOD, Hg, Pb, F, pesticides, Coliform bacteria, Surface and Ground water pollution, Self purification, Biomagnification, Minimata disease, Itai Itai disease, Methalmoglobinemia, Skeletal flourisis.

Solid Waste Pollution –Domestic and industrial wastes.

Noise Pollution – Limits & Effect of noise pollution.

Radiation Pollution –Strontium and Cesium effects.

Unit IX: Ecosystem Degradation and Management

Deforestation, Over grazing, Agriculture, Mining, Urbanization, Principles of Conservation, Genetic resources and Conservation strategies, Sustainable development.

Unit X: Wild Life

Extinct and Threatened Species, Wild Life Conservation (Santuries, National parks).

Recommended Books

1. Ian L. Pepper, Charler P. Gevba, Mark L. Brusseau, 1996, Pollution Science, Edited Academic Press.

2. Sharma, P.D., 1993, Environmental Biology and Toxicology.

3. Chapman J.L. and M.J. Reiss, Cambridge, 1995Ecology, Principle and Applications, University Press.

4. Verma, P.S. and Agarwal, V.K., 1998, Environmental Biology (Principles of Ecology) S. Chand & Co. Ltd.,

5. De, A.K., 1993, Environmental Chemistry, Wiley Eastern Ltd.

6. Kormondy, E.J., 1989, Concept of Ecology, Prentice-Hall of India Pvt. Ltd.

7. -------- 1992, Ecology, LSE-02, Blocks 1-4, Indira Gandhi National Open University

Animal Physiology (BSB)

Unit I

General and cellular basis of Animal Physiology. Body fluid compartments; transport across cell membrane, Homeostasis. Intracellular digestion, digestive enzyme, coordination of digestion. Circulation of body fluid, Body fluids, general plan, mammalian, blood vessels-blood flow, and blood cells.

Unit II

Respiration- Mechanism of breathing, transport of Oxygen and carbondioxide, O_2 dissociation curve. Role of kidney in the regulation of water, salt and acid base balance.

Unit III

Muscle and movement- Structure of skeletal, cardiac and smooth muscles, mechanism of muscle contraction.

Unit IV

Communication- Nervous system and nerve cells, nerve impulses, action potential, all or none response, synaptic transmission structure and functions of sensory organs. Structure and functions of hypothalamus, pituitary, Thyroid, Adrenal and pancreas, Neuro-endocrine regulation, second messenger concept, mechanism of action of hormones.

Unit V

Reproduction- Reproductive mechanisms, functional morphology of reproductive organs, Gametogenesis, reproductive cycle, hormonal control, cleavage pattern and organogenesis.

Unit VI

Animal cell culture: History of development of cell culture, simulating natural conditions for growing cells, Growth factors, Primary Culture, cell lines Growth Kinetics of cells in culture, Organ Culture, Transplantation of Cultured cells.

Unit VII

Expressing cloned proteins in animal cells. Over production and processing of chosen protein. The need to express in animal cells. Production of vaccines in animal cells. Production of monoclonal antibodies. Bioreactors for large scale culture of cells. Transplanting cultured cells.

Recommended Books

1- Guyton, A.C. and Hall, J.E., 2000, A Text Book of Medical Physiology, Xth Edition, W.B. Saunders Company.

2- Ganong, H, 2003, Review of Medical Physiology, 21st Edition, McGrawHill.

3- Strand Fluer, 1978, Physiology (a regulatory system approach) McMillan Pub. Co.

4- David Shier, Jakie, Butler & Lewis, 1996, Human Anatomy & Physiology, WCB, USA.

Plant Physiology (BSB)

Unit I: Plant Water Relations

Importance of water to plant life. Movement of water in plants in relation to water potential, osmotic potential, pressure potential and metric potential. Ascent of sap: mechanism of water absorption, Guttation and transpiration, Physiology of stomatal opening and closing, Significance of transpiration.

Unit II: Mineral Nutrition

Essential elements. Quantitative requirement and mechanism of uptake of various mineral elements. Role of essential elements in plant metabolism and their deficiency symptoms. Methods of studying mineral nutrient requirement.

Unit III: Photosynthesis

Historical summary of early photosynthesis research. Role of photosynthetic pigments. PS II and PS I complex and their inter-relationship. Mechanism of photosynthetic electron transport. Photophosphorylation. Mechanism of carbon dioxide fixation in C_3, C_4 and CAM plants. Photorespiration.

Unit IV: Respiration

Brief account of glycolysis. Aerobic and anaerobic respiration. Respiratory quotient (R.Q.) and determination of R.Q. values for different respiration substrates.

Unit V: Nitrogen Metabolism

Uptake and assimilation of various forms of nitrogen by plants. Nitrogen fixation: Nonsymbiotic and symbiotic nitrogen fixation. Assimilation of ammonia. Role of glutamine synthetase, glutamate synthetase and glutamate dehydrogenase. Synthesis of various amino acids.

Unit VI: Translocation and Distribution of Photoassimilates

Translocation of photoassimilates. Anatomy of Phloem tissue. Substances translocated in Phloem. Mechanisms of phloem transport. Phloem loading and unloading. Assimilate distribution.

Unit VII: Harmones and Growth Regulators

Plant growth regulators. Brief history, Distribution and their metabolism. Mechanism of action of plant growth regulators. Role of major plant growth regulators in various plant developmental processes. Importance of growth regulators in agriculture.

Unit VIII: Plant Movements, Vernalization and Dormancy

Phototropism: Phototropic signal perception, Signal transduction in Phototropism. Gravitropism: Graviperception, Signal transduction. Growth response. Nastic movements. Nyctinasty, Seismonasty. Photoperiodism. Biological clock. Vernalization. Dormancy: Significance, Seed dormancy Bud dormancy.

Unit IX: Plant Tissue Culture

Brief History. Elementary knowledge on various requirements and general technique. Factors involved in totipotency and various morphogenetic phenomena in tissue culture. Application of plant tissue culture.

Recommended Books

1. Salisbury, F.B. & Ross, C.W., 1992, Plant Physiology, (4th Edition) Wadsworth Publishing co. California, USA.
2. Taiz, L & Zeiger, E, 1998, Plant Physiology (2nd Edition) Sinauer Associates Inc. Publishers, Massacher setts USA.

3. Hopkins, W.G., 1999, Introduction to Plant Physiology, John Wiley & Sons, Inc. New York, USA.

4. Bhojwane, S.S. and Razdan, M.K., 1996, Plant Tissue Culture : Theory and Practice (a rev. ed), Elsvier, Science Publishers, New York, USA.

Biochemistry (BSB)

Unit I: Concept of Biochemistry

Definition and scope of biochemistry, Units of length used in biochemistry. Water, Fitness of aqueous environment for living organisms. Make up of living organisms and their ability to exchange energy and matter. ATP-ADP cycle.

Unit II: Biomolecular Structure

1.	Proteins and Amino Acids- Protein content of cells; composition and biological functions of proteins. Amino acids; Zwitter ion nature; properties and reactions of amino acids. Peptide bond formation; peptides; dihedral angle; Primary, secondary, tertiary and quaternary structures of proteins; conformation; classification. Correlation of biological properties with native structure of proteins. Denaturation.

2.	Nucleic Acids- Nucleotide composition and structure, hydrogen bonding. Double helix and other helices. Structure of t-RNA, Super-coiling. Properties of DNA Denaturation.

3.	Carbohydrates- Simple sugars, reducing and non-reducing sugars. Different kinds of linkages- Classification into monosaccharides, oliogsacharides and polysaccharides. Mutarotation and inversion. Derivatisation in glycoprotein, etc.

4.	Lipids- Biological functions; classification into fatty acids, glycerol lipids, essential and non-essential fatty acids. Structure and derivatisation. Lipids as storage material. Surface monolayers and lipid vesicles. Conformation.

Unit III: Enzymology

Nature of enzyme catalysis. Naming of enzymes. Michaelis-Menten concept of enzyme action; activation energy. Active, binding and catalytic sites, Factors affecting enzymes catalyzed reactions (time, enzyme conc., substrate concentration, pH, temperature) Inhibition. Allosteric enzymes; mechanism of action; control of enzyme activity; multienzyme systems.

Unit IV: Metabolic Generation of Energy

Definition of metabolism; energy relationship between catabolic and anabolic pathways. Stages in the extraction of energy from food stuff. ATP as the energy currency of the cell. Generalized concept of glycolysis; Kreb's cycle, glycogen synthesis, oxidative phosphorylation and electron transport chain.

Unit V: Utilization of Energy

Energy utilization in anabolic processes.
Dark reaction of photosynthesis – fixation of carbon dioxide, reduction and combination, regeneration of ribulose 1,5– bisphosphate, C3, C4 and CAM plants, nitrogen fixation.
Biosynthesis for storage – polysaccharides, fats and triglycerides
Muscular contraction.

Recommended Books

1. Voet & Voet, 2000, Biochemistry, John Wiley, New York

2. Zubay, 1995, Biochemistry, Brown Publishers.

3. Lehminger, 2000, Principles of Biochemistry, CBS Publishers.

4. Stryer, L., 2002, Biochemistry, W.H. Freeman.

5. Harper, 2003, Biochemistry, McGrawHill.

Microbiology & Immunology (NEW)

(Part-A Microbiology)

Unit I

History of Microbiology: the microscope, spontaneous generation, biogenesis, fermentation, germ theory of diseases, Microbial Diversity: Prokaryotes and Eukaryotes, Microalgae, Microfungi, Protozoa, Bacteria and Viruses, Bacterial size, shapes and pattern of arrangement, Structures external to cell wall: Flagella, Pili, Capsule, sheath, Prosthecae and stalk. The cell wall structure: Gram positive and gram negative bacteria. Structures internal to cell wall: Cytoplasmic membrane, Cytoplasmic inclusion and nuclear material.

Unit II

Reproduction and growth of bacteria: Modes of cell division, Growth curve, Lag phase, Exponential phase, stationary phase and death phase, Nutritional requirements. Nutritional types of bacteria, Phototrophs, Chemotrophs, Autotrophs, Heterotrophs, Obligate parasites. Bacteriological media, Selective media, Maintenance media, Differential media.

Unit III

Control of microorganisms, Definitions and fundamentals of control, Physical agents / processes for control: high temperatures, low temperature, dessication, osmotic pressure, radiation, filtration, host parasite interaction: pathogenicity, virulence and infection, Defense mechanisms of host: physical barriers, chemical barriers, biological barriers, Fever, Inflammation and Phagocytosis.

Unit IV

Nitrogen fixation by Microbes: Nonsymbiotic nitrogen fixation, Symbiotic nitrogen fixation. Microbiology of fermented food: Dairy products, Wine, Beer and other fermented alcoholic beverages.

PART – B

Immunology

Unit I

The Immune system and Immunity along with historical perspective. Antigen – antibody and their structure, the organs and the cells of the immune system and their function.

Unit II

Humoral and cell mediated immunity, Antigen- antibody interaction, Origin of diversity in the immune system, Effector mechanisms, Immunity to infectious diseases, Vaccines.

Recommended Books:

1-   Pelczer & Krieg, 1986, Microbiolgoy, McGraw Hill.

2-   Prescot, Harley & Klein, 2000, Microbiology, McGrawHill

3-   Ronald M. Atlas, 1987, Microbiology, Fundamentals and Applications, Prentice Hall.

4-   Stanier, 1986, General Microbiology, McMillan Publishing Co.

5-   Ivan M. Roitt, 2001, Essential Immunology, 6th Edition, Blackwell Science Publications, England.

6-   Davis, 1980, Microbiology, Harper & Row.

7-   Coleman, R.M., 1992, Fundamental Immunology, WCB, McGraw-Hill.

8-   Benjamini, E., Coico, R., Sunshine, G., 2000, Immunology : A Short Course, John Willey & Sons Inc. Publications, USA.

Information Technology & Bioinformatics (BSB)

Unit I: Basic Concept

Computer and its components, Characteristics of Computer, Generation of Computers, Types of Digital Computer, Main frame, Workstation, Super computer.

Hardware basics: Processors, motherboard, slots / cards, bus, parallel and serial ports. Various storage devices, Client-Server concepts. Memory.

Software basics: Data vs. information, Softwares : types of softwares, Firmware, Operating systems, Lanuguages, Compilers, Interpreters, Ideas of portability and platform dependence, MS-DOS, Windows and Unix OS's, Linux as a Unix alternative.

Suggested Experiments: 1. Installation of Windows, and Linux on PCs.

2. Lab assignment on DOS and Unix commond.

Unit II: Computer Programming

Various languages, Detailed study of C programming language, C fundamentals, loops, control flow, arrays and pointers, Memory allocation, Basic ideas of C++ and Java based object oriented programming (no programming in Java or C++)

Suggested experiments: 1. Programming in C.

Unit III: Internet Technology

Internet and world wide web, Client- server organization, FTP, HTTP, Telnet, Gopher, and other protocols, POP mails, Concepts of mail servers and clients, Browsers and mail managers, Netscape and Internet explorer, Internet domain.

Searching the web, Search engines, Web indexes, Meta search engines, Internet security. Concepts of firewall, digital signature, remote login, Java applets and servelets, Scripting, Basic ideas of CGI and pearl (only the working principles).

Suggested experiments: 1. Setting up a web mail account.

2. Configuring Netscape messenger and Outlook POP mails.

3. Find the recent publications on a given research problem.

Unit IV: Work Processing and Documentation

Basic word processing in Microsoft word. Power Point and Excel, Preparing and processing text documents.

Suggested experiments: 1. Making a presentation in PowerPoint.
2. Drawing tables and graphs in Excel.

Unit V: Introduction to Bioinformatics

What is Bioinformatics, Use of infiormation technology for studying Biosciences, Emerging areas in Bioinformatics, Future prospects of Bioinformatics.

Unit VI: Bioinformatics Basics

Introduction to Genomics, Introduction to Proteomics, Human Genome Project, Biological Software, Public Database, Gene Bank, Using Public Database.

Unit VII: Computational Methods

Gene Prediction, Sequence alignment and Sequence searching, Multiple sequence alignment, Phylogenetic analysis, Protein sequence analysis, Protein structure prediction.

Unit VIII: Database Management System and Data Mining

Basics of database management system, SQL, Artificial Neutral Network Technology, Gentic alogorithm , Decision trees.

Experiment 1-   Accessing and using of public data bases

Experiment 2-   BLAST & FAST ……. etc.

Recommended Books

1. Yashwant Kanitkar, Programming in C, BPB Publications.
2. Balaguruswamu, E., Programming in C, Tata McGrawHill.
3. David W. Mount, Bioinformatics, Sequence & Genome Analysis, Cold-Spring Harbor Lab Press.
4. Rastogi, B.C., Bioinformatics, Concept, Skills & Applications, CBS Publications.